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#### Creating and Managing Successful Groups

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# **Creating and Managing Successful Groups**

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# **Content for Today**

- Why is group work an essential component of our classes?
- What are the standard practices in forming groups, and what are the outcomes from this practice?
- What does the research say about forming successful groups?
- Case Study: group work in senior-level road design course

#### Working in Groups as Civil Engineers Scholarship Imitating Life

 The Accreditation Board for Engineering and Technology (ABET) sets required skills for engineering graduates, commonly referred to as "a-through-k"

#### Working in Groups as Civil Engineers Scholarship Imitating Life

- Some parts of ABET "a-through-k" are straightforward:
  - (a) an ability to apply knowledge of mathematics, science, and engineering
  - (b) an ability to design and conduct experiments, as well as to analyze and interpret data
  - (c) an ability to design a system, component, or process to meet desired needs with realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
  - (e) an ability to identify, formulate, and solve engineering problems
  - (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

#### Working in Groups as Civil Engineers Scholarship Imitating Life

- Other parts of ABET "a-through-k" are harder to implement in a classroom environment:
  - (d) an ability to function on multidisciplinary teams
  - (f) an understanding of professional and ethical responsibility
  - (g) an ability to communicate effectively
  - (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and social context
  - (i) a recognition of the need for, and ability to engage in life-long learning
  - (j) a knowledge of contemporary issues

#### **Group Formation Standard Practice**

- Most group projects start in a familiar way:
  - Step 1: Students form their own groups
  - Step 2: Remaining students are assigned groups at random

#### **Typical Group Process**

- The process for completing the work also follows a familiar pattern:
  - Step 1: One person takes leadership of the group, and splits the work into equal parts.
  - Step 2: The day before it's due, everyone sends back what they've done on their part.
  - Step 3: The person in charge sees that the work done by their peers is unusable, and completes the project by themselves.

#### **Typical Group Results**

- From the department's perspective:
  - A satisfactory project is submitted
  - Everyone in the course receives good marks
  - The department can demonstrate to ABET that the goals are being met
- From the student's perspective
  - Student resentment due to unequal efforts
  - Only some of the students have achieved the learning outcomes

# Typical Group Results From Teaching Assistant Experience



#### Literature on Group Work Engineering-Specific Resource

- Johri, Aditya, and Barbara M. Olds, eds. *Cambridge Handbook of Engineering Education Research*. Cambridge University Press, 2014.
  - Chapters of interest on this topic include:
    - 8: Problem-based and Project-based Learning...
    - 10: Curriculum Design in the Middle Years
    - 20: Research-guided Teaching Practices...
    - 24: Studying Teaching and Learning in Undergraduate Engineering Programs...
    - 29: The Science and Design of Assessment...

## Literature on Group Work Selected Reading

- Prince, Michael. "<u>Does Active Learning Work? A Review</u> of the Research." Journal of Engineering Education 93.3 (2004): 223-231.
- Barron, Brigid. "<u>When Smart Groups Fail.</u>" The Journal of the Learning Sciences. 12.3 (2003): 307-359.
- Newstetter, Wendy C. "<u>Of Green Monkeys and Failed</u> <u>Affordances: A Case Study of a Mechanical Engineering</u> <u>Design Course.</u>" *Research in Engineering Design* 10.2 (1998): 118-128.

#### Case Study Context

- Speaker appointment is 30% teaching, with a load of one course per semester (for now)
- Courses taught thus far categorized as "design" technical electives
  - Senior/graduate overlap
  - Significant project components with groups arriving at unique solutions
  - Hands-on with standard software used in consulting

# Case Study Context

- CIVE 462/862 Highway Design
  - Five individual homework assignments
    - Median time spent per person (on all five): 21 hours
  - Six group project assignments
    - Median time spent per person (on first four): 22 hours
- CIVE 463/863 Traffic Engineering
  - Eight individual homework assignments
    - Median time spent per person (on first five): 20 hours
  - One group project assignment
    - Median time spent: unknown

## Case Study Context

- CIVE 462/862 Highway Design Projects
  - 1. Identify problems around town (intersection, interchange, and roadway alignment)
  - 2. Redesign of interchange using planning-level analysis tools

**Roadway Alignment Project** 

- **3**. Horizontal alignment
- 4. Vertical alignment
- 5. Cross-sections and limit of work
- 6. 30% completion plan set

# Case Study Outcomes of Group Management

- By making informed decisions when creating groups, we can:
  - Maximize the percentage of successful groups
- By helping manage the time spent during the project we can:
  - Maximize the learning outcomes of each student in the class
  - Minimize the percentage of imploding groups
  - Calibrate both student efforts and project scopes

## Case Study Group Formation

- We hold these truths to be self-evident... that <u>not</u> all students are created equal!
- That all students have unique goals in the class
- That all students have unique time commitments outside of class
- That all students have unique background experience related to the topic

# Case Study Group Management Software

- Preferred group management software: <u>www.catme.org</u>
  - 28 parameters to choose from
  - Weighted as similar or disparate for group formation
  - Ability to pair or separate students/groups
  - Recently introduced a fee to use



# Case Study Group Management Software

• Sub-set of 8 parameters chosen for Highway Design class



# Case Study Group Management Software

• Group formation can be re-run multiple times. Produces slightly different results each time and can be fine-tuned

Schedule	Pct Busy	Credits	Year	CivE Sub	Software	Writing	Commitment Lvl	Tot (Max 25)
C. device have a barriet	50%	13 (1)	Senior	Transport	None	Basic	Whatever it takes	
5 days/week with	38%	16 (3)	Senior	Transport	Basic	Average	5-7 hours per week	
2+ hr meeting blocks	20%	15 (2)	Senior	Transport	None	Average	5-7 hours per week	
(schedule summary)	32%	15 (2)	Junior	Structural	None	Average	2-4 hours per week	
4.00		1.00	0.00	0.00	0.00	0.00	1.00	7.00
3 days/week with	38%	13 (1)	Senior	Transport	None	Average	5-7 hours per week	
2+ hr meeting blocks	55%	15 (2)	Senior	Geotechnical	None	Average	5-7 hours per week	
(schedule summary)	69%	17 (3)	Senior	Hydro	Basic	Basic	2-4 hours per week	
0.80		2.00	-4.00	3.00	1.67	1.00	0.67	7.13
	50%	18 (5)	Senior	Geotechnical	None	Good	5-7 hours per week	
5 days/week with	46%	18 (5)	1yr Masters	Transport	Basic	Average	8-10 hours per week	
2+ hr meeting blocks	38%	13(1)	1vr Masters	Transport	None	Average	Whatever it takes	
(schedule summary)	38%	18 (5)	Senior	Municipal	None	Good	5-7 hours per week	
4.00		0.00	0.00	1.50	0.00	0.00	1.00	7.50
	40%	10(1)	1yr Masters	Transport	None	Basic	Whatever it takes	
3 days/week with	41%	19 (5)	Senior	Geotechnical	None	Average	5-7 hours per week	
2+ hr meeting blocks	22%	15 (2)	Senior	Transport	Basic	Average	2-4 hours per week	
(schedule summary)	55%	16 67 (3)	Doctoral	Transport	None	Average	2-4 hours per week	
1.87	1000000	2.00	2.00	0.00	0.00	0.00	1.00	7.87
	60%	14 (2)	Junior	Environmental	None	Average	5-7 hours per week	
4 days/week with	14%	9(1)	1yr Masters	Transport	None	Average	Whatever it takes	
2+ hr meeting blocks	50%	12(1)	Senior	Transport	None	Good	5-7 hours per week	
(schedule summary)	40%	17 (3)	Senior	Transport	Good	Basic	5-7 hours per week	
2.40		1.00	2.00	0.00	0.00	1.50	0.00	7.90
3 days/week with	31%	20 (5)	Senior	Structural	Basic	Average	5-7 hours per week	
2+ hr meeting blocks	42%	16 (3)	Senior	Transport	Good	Good	5-7 hours per week	
(schedule summary)	65%	16 (3)	Senior	Transport	None	None	Whatever it takes	
0.80	Contraction (Contraction)	0.67	-4.00	1.00	5.00	3.00	0.67	9.13
5 days/week with	25%	12 (1)	Junior	Transport	None	Average	5-7 hours per week	
2+ hr meeting blocks	35%	14 (2)	Senior	Transport	None	Basic	5-7 hours per week	
(schedule summary)	38%	16 (3)	Senior	Transport	Basic	Average	2-4 hours per week	
4.00		2.00	1.33	-3.00	1.67	1.00	0.67	9.67
	24%	12 (1)	Sophomore	Structural	None	Basic	5-7 hours per week	
6 days/week with	52%	10(1)	Senior	Transport	Expert	Average	2-4 hours per week	
2+ nr meeting blocks	52%	12(1)	Senior	Transport	Good	Average	5-7 hours per week	
(schedule summary)	61%	19 (5)	Senior	Transport	None	Good	Whatever it takes	
4.00		0.00	0.00	0.00	2.50	1.50	1.00	10.00
C. January Lands	47%	21 (5)	Junior	Structural	Basic	Good	5-7 hours per week	
6 days/week with	32%	23 (5)	Senior	Transport	Good	Average	2-4 hours per week	
2+ nr meeting blocks	32%	17 (3)	Senior	Transport	None	Average	Whatever it takes	
(schedule summary)	40%	13 (1)	Senior	Transport	None	Basic	Whatever it takes	
	Schedule 5 days/week with 2+ hr meeting blocks (schedule summary) 4.00 3 days/week with 2+ hr meeting blocks (schedule summary) 0.80 5 days/week with 2+ hr meeting blocks (schedule summary) 4.00 3 days/week with 2+ hr meeting blocks (schedule summary) 1.87 4 days/week with 2+ hr meeting blocks (schedule summary) 2.40 3 days/week with 2+ hr meeting blocks (schedule summary) 0.80 5 days/week with 2+ hr meeting blocks (schedule summary) 0.80 5 days/week with 2+ hr meeting blocks (schedule summary) 4.00 6 days/week with 2+ hr meeting blocks (schedule summary) 4.00 6 days/week with 2+ hr meeting blocks (schedule summary) 4.00 6 days/week with 2+ hr meeting blocks (schedule summary) 4.00	Schedule     Pct Busy       5 days/week with 2+ hr meeting blocks (schedule summary)     50% 38% 32%       4.00     32%       3 days/week with 2+ hr meeting blocks (schedule summary)     69% 69%       5 days/week with 2+ hr meeting blocks (schedule summary)     50% 69%       5 days/week with 2+ hr meeting blocks (schedule summary)     40% 41% 22% 55%       3 days/week with 2+ hr meeting blocks (schedule summary)     40% 41% 22% 55%       1.87     60% 14% 50% (schedule summary)       3 days/week with 2+ hr meeting blocks (schedule summary)     31% 42% 65%       3 days/week with 2+ hr meeting blocks (schedule summary)     35% 35% 35% 35% 35% 35% 35% 52% 52% 52% 52% 52% 52% 52% 52% 52% 5	Schedule     Pct Busy     Credits       5 days/week with 2+ hr meeting blocks (schedule summary)     38% 20% 32%     13 (1) 38% 15 (2) 32%       4.00     1.00       3 days/week with 2+ hr meeting blocks (schedule summary)     38% 69%     13 (1) 20% 15 (2)       69%     17 (3)       0.80     2.00       5 days/week with 2+ hr meeting blocks (schedule summary)     69% 69%     17 (3)       0.80     2.00       5 days/week with 2+ hr meeting blocks (schedule summary)     48(5)       4.00     0.00       3 days/week with 2+ hr meeting blocks (schedule summary)     18 (5)       4.00     0.00       3 days/week with 2+ hr meeting blocks (schedule summary)     55%       55%     15 (2)       1.87     2.00       4 days/week with 2+ hr meeting blocks (schedule summary)     60% 50%     14 (2)       3 days/week with 2+ hr meeting blocks (schedule summary)     31% 65%     20 (5)       5 days/week with 2+ hr meeting blocks (schedule summary)     36%     16 (3)       0.80     0.67     6 days/week with 24%     12 (1)       2+ hr meeting blocks (schedule summary)     35%	Schedule     Pct Busy     Credits     Year       5 days/week with 2+ hr meeting blocks (schedule summary)     50% 38%     13 (1) 38%     Senior       4.00     1.00     0.00       3 days/week with 2+ hr meeting blocks (schedule summary)     38%     13 (1) 20%     Senior       3 days/week with 2+ hr meeting blocks (schedule summary)     38%     13 (1) 50%     Senior       5 days/week with 2+ hr meeting blocks (schedule summary)     50%     15 (2) 38%     Senior       69%     17 (3)     Senior       69%     13 (1)     1yr Masters       38%     13 (1)     1yr Masters       38%     13 (1)     1yr Masters       38%     18 (5)     Senior       4.00     0.00     0.00       3 days/week with 2+ hr meeting blocks (schedule summary)     55%     16 (2)     Senior       1.87     2.00     2.00     2.00     2.00       4 days/week with 2+ hr meeting blocks (schedule summary)     31%     20 (5)     Senior       50%     12 (1)     Senior     2.00     3.00       3 days/week with 2+ hr meet	Schedule     Pet Busy     Credits     Year     CivE Sub       5 days/week with 2+ hr meeting blocks (schedule summary)     50% 32%     13 (1) 38%     Senior     Transport       4.00     1.00     0.00     0.00     0.00       3 days/week with 2+ hr meeting blocks (schedule summary)     38%     13 (1)     Senior     Transport       5.00     3 days/week with 2+ hr meeting blocks (schedule summary)     89%     17 (3)     Senior     Geotechnical       6.00     2.00     -4.00     3.00     3.00     3.00       5 days/week with 2+ hr meeting blocks (schedule summary)     50%     18 (5)     Senior     Hydro       3.8%     18 (5)     Senior     Municipal     4.00     10 (1)     1yr Masters     Transport       3 days/week with 2+ hr meeting blocks (schedule summary)     40%     10 (1)     1yr Masters     Transport       55%     15 (2)     Senior     Transport     Senior     Senior       4.00     10 (1)     1yr Masters     Transport     Senior     Transport       4.00     10 (1)     1yr Masters	Schedule     Pet Busy     Credits     Year     CivE Sub     Software       5 days/week with 2+ hr meeting blocks (schedule summary)     50% 32%     13 (1) 15 (2)     Senior     Transport     None       38% 20%     15 (2) 32%     Senior     Transport     None       4.00     0.00     0.00     0.00     0.00     0.00       3 days/week with 2+ hr meeting blocks     38% 55%     13 (1)     Senior     Transport     None       6.80     2.00     -4.00     3.00     1.67     Senior     Geotechnical     None       5 days/week with 2+ hr meeting blocks     50% 46%     18 (5)     Senior     Geotechnical     None       3 days/week with 2+ hr meeting blocks     50% 18 (5)     18 (5)     Senior     Transport     None       3 days/week with 2+ hr meeting blocks     40%     10 (1)     1yr Masters     Transport     None       3 days/week with 2+ hr meeting blocks     60%     14 (2)     Junior     Transport     None       3 days/week with 2+ hr meeting blocks     60%     14 (2)     Junior     Transport	Schedule     Pct Busy     Credits     Year     Cive Sub     Software     Writing       5 days/week with 2+ hr meeting blocks (schedule summary)     50%     13 (1)     Senior     Transport     None     Average       4.00     32%     15 (2)     Senior     Transport     None     Average       4.00     1.00     0.00     0.00     0.00     0.00     0.00     Average       4.00     1.00     0.00     0.00     0.00     0.00     0.00     0.00       3 days/week with 2+ hr meeting blocks     55%     15 (2)     Senior     Transport     None     Average       6.80     2.00     -4.00     3.00     1.67     1.00     Gaotechnical     None     Average       2.4 hr meeting blocks (schedule summary)     38%     13 (1)     1yr Masters     Transport     None     Average       4.00     0.00     0.00     1.50     0.00     0.00     0.00       4.04     40%     10 (1)     1yr Masters     Transport     None     Average	Behedule     Pet Busy     Credits     Year     CivE Sub     Software     Writing     Commitment Lvi       5 days/week with 2+hr meeting blocks     50%     16 (3)     Senior     Transport     None     Basic     Average     5-7 hours per week       4.00     15 (2)     Senior     Transport     None     Average     5-7 hours per week       4.00     0.00     0.00     0.00     0.00     1.00     2.4 hours per week       4.00     3days/week with     38%     13 (1)     Senior     Transport     None     Average     5-7 hours per week       2+ hr meeting blocks     65%     15 (2)     Senior     Geotechnical     None     Average     5-7 hours per week       6.80     2.00     4.00     3.00     1.67     1.00     0.67     1.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00     0.00     0.00     1.67     1.00     0.67     7 hours per week       6.40     0.00     0.00     1.67     1.00     3.67     Nonee

# Case Study Ongoing Group Management

 Setting groups up to be successful isn't the end of the story, it's the beginning

- Six one-week-long projects over the duration of the semester.
- The same groups throughout, with projects building on one another.

# Case Study Group Management - Time

110-1	Project Es	stimatin	ng Works	heet -	Group			
Group Member 1: Group Member 2:					Project No.			
Group Member 3: Group Member 4:	<u></u>	#2						
G	Broup Esti	imated	Workload	d for Pro	oject			
Organizing 0.25 hrs leading 0.75 hrs supporting			Training	ng 0 hrs leading				
				0 hrs supporting				
Site Visit	/isit 27 hrs leading			4 hrs	4 hrs leading			
81 hrs supporting				4 hrs	supporting			
Write-up		QA/QC	1 hrs	leading				
(80 <del>8</del>	0 brs supporting							
1.1 <del>1</del>		ling	6		supporting			
T-4-	1 26 25							
IOta	30.25	hrs leadii	ng 89.7	75 hrs sup	porting			
1 Ota (9	0.25 without site	hrs leadii visit)	ng <u>89.7</u> (8.7	75 hrs sup 75 without sit	porting e visit)			
Draft In Leading H	ndividual	hrs leadii visit) Worklo (Hours w	ng <u>89.7</u> (8.7 pad Assig	75 hrs sup 75 without sit nment fo idently or lea	oporting e visit) or Projec ding coopera	ct tive work.)		
Draft In Leading H Group Member	0.25 without site	hrs leadir visit) Worklo (Hours w Train	ng 89.7 (8.7 pad Assig rorking indepen	75 hrs sup 75 without sit nment fo idently or lea	pporting e visit) or Projec ding coopera Write-up	ct tive work.)		
Draft In Leading H Group Member 1	0.25 without site ndividual ours Organize 0	hrs leadii visit) Worklo (Hours w Train 0	ng 89.7 (8.7 pad Assig rorking indepen Site Visit 0	75 hrs sup 75 without sit nment fo idently or lea Drafting 0	porting e visit) or Project ding coopera Write-up 0	ct tive work.) QA / QC 0		
Draft In Leading H Group Member 1 2	0.25 without site ndividual ours Organize 0 0.25	hrs leadir visit) Worklo (Hours w Train 0 0	ng 89.7 (8.7 pad Assig vorking indepen Site Visit 0 0	75 hrs sup 75 without sit nment found Indentiy or lea Drafting 0 4	porting e visit) or Project ding coopera Write-up 0 0	ct tive work.) QA / QC 0 1		
Draft In Leading H Group Member 1 2 3	0.25 without site ndividual ours Organize 0 0.25 0	hrs leadir visit) Worklo (Hours w Train 0 0 0	ng 89.7 (8.7 pad Assig rorking indepen Site Visit 0 0 0	75 hrs sup 75 without sit nment for identiy or lea Drafting 0 4 0	porting e visit) or Project ding coopera Write-up 0 0 2	ct tive work.) QA / QC 0 1 0		
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Draft II Leading H Group Member 1 2 3 4 Supporting	30.25   0.25   without site   ndividual   ours   0   0.25   0   0.25   0   0.25   0   0.25   0   0.25   0   0   0   0   0   0   0	hrs leadil visit) (Hours w Train 0 0 0 0 0 0 0 0 0 0 0	89.7       vad Assig       vorking indepen       Site Visit       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0	75 hrs sup 75 without sit nment for identily or lea Drafting 0 4 0 0 0 0	porting e visit) or Project ding coopera Write-up 0 0 2 2 2 in a support m	ct tive work.) QA / QC 0 1 0 0 0 0		
Draft II Leading H Group Member 1 2 3 4 Supporting Group Member	30.25   0.25   without site   ndividual   ours   0   0.25   0   0.25   0   0.25   0   0.25   0   0.25   0   0   0   0   0   0   0   0   0   0   0   0   0	hrs leadil visit) (Hours w Train 0 0 0 (Hu Train	ng 89.7 (8.7 vad Assig vorking indepen Site Visit 0 0 0 27 ours working co Site Visit*	75 hrs sup 75 without sit nment findently or lea Drafting 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	or Projecting e visit) or Project ding coopera Write-up 0 2 2 in a support m Write-up	ct tive work.) QA / QC 0 1 0 0 0 0 0 0 0 0		
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Tota (S Draft II Leading H Group Member 1 2 3 4 Supporting Group Member 1 2	30.25   0.25   without site   ndividual   ours   0   0.25   0   0.25   0   0.25   0   0.25   0   0.25   0   0.25   0   0.25   0   0.25   0   0.25   0   0.25   0	hrs leadil visit) (Hours w Train 0 0 0 (He Train 0 0	ng 89.7 (8.7 vorking indepen Site Visit 0 0 0 27 ours working co Site Visit* 27 27	75 hrs sup 75 without sit nment for identity or lea Drafting 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	or Project or Project ding coopera Write-up 0 2 2 in a support m Write-up 2 2 2	Ct tive work.) QA / QC 0 1 1 0 0 0 0 0 0 0 0 0 0 0		
Group Member 1 2 3 4 Supporting Group Member 1 2 3 3 3 3 3 3 3 3	30.25   0.25   without site   ndividual   ours   0   0.25   0   0.25   0   0.25   0   0   0.25   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0.25   0   0.25   0   0.25	hrs leadil visit) (Hours w Train 0 0 0 (Hi Train 0 0 0	89.7       ead Assig       varking independent       Site Visit       0       27       27       27       27       27       27	75 hrs sup 75 without sit nment for identity or lea Drafting 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	porting e visit) or Project ding coopera Write-up 0 2 2 in a support n Write-up 2 2 0	Ct tive work.) QA / QC 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0		

Post-	Project R	ecordir	ng Works	heet -	Group		
Group Member 1:	···				Drainat	No	
Group Member 2:				su:	Fillect	NO.	
Group Member 3:				- 42	0		
Group Member 4:	22 25	_ 2					
1	Individua	al Hour	s Spent o	on Proje	ect		
Leading Ho	ours	(Hours w	orking indepen	dently or lea	ding coopera	tive work.	
Group Member	Organize	Train	Site Visit	Drafting	Write-up	QA/Q	
1	0	0	0	0	3.5	0	
2	0.5	0	0	5	0.5	1.5	
3	0	0	0	0	2.5	0	
4	0	0	0	1	1.5	0	
Group Member	Organize	Train	Site Visit	Drafting	Write-up	QA / Q	
1	0.5	0	0	0	0	0	
2	0	0	0	0	0	0	
3	0.5	0	0	0	0	0	
4	0.5	0	0	1	0	0	
	Group	Hours	Spent on	Project	t		
Organizing 0.5 hrs leading			Training	0 hrs	s leading		
1.5	1.5 hrs supporting			0 hrs	s supporting		
Site Visit 0 hrs leading			Drafting	6 hrs	s leading		
0	0 hrs supporting			1 hrs supporting			
Write up 9	hrs leading	9	QA/QC	1.5 hrs	s leading		
write-up 8							
00	hrs suppo	rting	2	0 hrs	s supporting		

#### Case Study Management – Formative Feedback



# Case Study Outcomes – Calibration Needed



# Case Study Outcomes – Calibration Needed



# Case Study Outcomes – Calibration Needed



#### Case Study Issues on the Table

- This data has thus far been utilized for formative feedback within the classroom setting.
  - It is time consuming, and provides good results, but the return on investment is questionable.
- How to leverage this information to generate papers and proposals?
- If not publishing pre-tenure, how can future data needs be anticipated so that post-tenure publications can incorporate multiple years of data?









#### **Next Steps**

#### Leveraging Content Mastery

- Draft syllabus prepared for: Foundations of Engineering Pedagogy
- Topics include:
  - History of Engineering Education
  - Motivation in Education
  - Learning Theories
  - Active Learning Strategies
  - Learning Styles, Individual Cognitive Development
  - Problem and Project Based Learning
  - Learning in Groups and Communities
  - Assessing Learning
  - Technology and Learning
  - Engineering Design
  - Freshmen to Seniors, and Everything In-between
  - Improvement in Engineering Education (and Barriers)

#### Next Steps Formalizing Group Management Architecture

- Potential to formalize the group management work that I've done in a number of formats.
  - Projects are based on specific site, but with (a fair amount of) work could be generalized for any site.
- Formal lab book with the step-wise instructions.
- Applied textbook on the topic of the course, featuring a template for extensive project work in the class.
- Conference publications on outcomes from the methodology.
- None of this seems right for pre-tenure pursuit.

#### Next Steps

#### Leverage other classroom innovations

- Potential to leverage the "talking points" method I use for classroom active/passive engagement.
- Daily handout with a series of questions tied back to lecture slides that go beyond the content and seek the "why is this important" or "how is this applied in the real world" type knowledge.
- Reminds me to pause periodically during lecture.
- Lets students know that some interaction is expected every few slides.
- Gives students opportunity to anticipate question, and compose response ahead of time.

#### Next Steps Leverage other classroom innovations

- Talking Points applications:
- Potential funding proposal to study impacts of passive classroom engagement.
- Examine contributing factors to learning outcomes of class:
  - Level of engagement with written (un-graded) handout.
  - Level of engagement with verbal communication.
  - Stated intention for engagement with course.
  - Standardized test scores.
  - Overall GPA coming into the class.
  - Etc.

#### Questions? Collaboration? Contact any time!

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